BLUE M

CF740H, 750H, 760H, 770H

MP MASTER

MA34376

SET 1 of 6

MARCH 1958

INSTRUCTION NO. I-127
SERIAL NO. A-508 & UP

OPERATING & MAINTENANCE INSTRUCTIONS FOR BLUE M COUNTER FLOW CONTROLLED HUMIDITY & TEMPERATURE CABINETS MODELS CF-740H CF-750H CF-760H & CF-770H

SPECIFICATIONS (All Models)

a) Temperature range, humidity range, electrical characteristics and construction specifications are given on enclosed catalog sheet and nameplate. Cabinet conforms to these specifications unless otherwise noted on separate attached sheet.

INSTALLATION

a) Cabinet must set in level position to insure proper water level. If not leveled, wet bulb heaters may not be properly immersed; affecting operation.

b) Connect water line to 3/8" copper tube flare fitting marked "WATER IN". Water enters directly through water strainer, adjustment valve, solenoid and cooling coil.

c) Connect 1" S/S pipe overflow drain pipe at rear to 1" Minimum pipe or tube to suitable drain. This is a gravity drain; back pressure, undersized drain connection lines or long pipe runs must be avoided to prevent cabinet flooding. Water from cooling coil drains directly into water reservoir to cabinet bottom. Overflow drain tube extends from floor of cabinet; allexcess water drains through overflow pipe. Blue M's system provides fool proof water level control plus several complete fresh water chanes per day. Continuous fresh water admittance prevents contamination of reservoir and eliminates need for periodic draining.

d) Condensate drain tube removes water condensing between outer and inner doors or water accumulated when inner door is not latched firmly. Connect tube to drain or suitable container.

e) Connect proper voltage to electrical outlet at rear of control compartment. BE SURE TO PROVIDE A SECURE AND PERMANENT GROUND CONNECTION.....
NOTE: Extreme variation of line voltage causes slight temperature shift within cabinet. While unimportant in most heating chambers, shift of 1 ° or 2 ° F. becomes extremely important when maintaining a constant Relative Humidity.
AVOID CONNECTING TO LIGHTING CIRCUIT OR UNDERSIZED OR OVERLOADED LINES.

f) Locate cabinet in room which maintains reasonable constant ambient temperature. Extreme ambient temperature changes will affect control operation slightly. (1° to 3° F.)
DO NOT LOCATE CABINET NEAR HEAT SOURCE (i.e. RADIATORS, UNIT HEATERS, ETC.) DO NOT LOCATE IMMEDIATELY ADJACENT TO WINDOWS OR OUTSIDE EXPOSURES.

g) Open "Cooling Coil" Valve 2-3 turns. Final adjustment may be made after unit has stabilized. Fine adjustment is covered in section covering operation. (Paragraph "h", Pg. 3). This valve must NEVER, at any time, be completely closed; it regulates cooling water supply and water reservoir level.

h) Fill Hygrometer Water Bottle: Place hygrometer near inner glass door to observe reading easily while cabinet is operating. USE DISTILLED WATER. CHANGE WICK FREQUENTLY. Keep water bottle filled at all times. Wet bulb reading rises slightly when water in hygrometer bottle is depleted appreciably. FILL BEFORE EACH TEST.

i) Cabinets equipped with wet and dry bulb recorder; open valve marked "Wet Bulb Wick box" and fill water box. When box is filled, close valve until minimum trickle of water flows constantly. This valve should be reset periodically by opening it

(Continued)

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full for 1-2 seconds and readjusting as required. Consult enclosed instrument manual for care and use of recorder.

A bottle of ANTI FOG material supplied to maintain visibility thru inner glass observation door at high humidities. When applied to the inside surface of the glass, it imparts a wetting characteristic to the glass. It Causes condensed water to film instead of accumulate in small droplets. Any non-ionic type wetting agent may be used with equal success.

ENERAL DESCRIPTION OF OPERATION AND OPERATING PRINCIPLE.

The various controls, valves, and settings may be better understood if our operating principle is explained in detail. Moreover, by knowing various functions of controls, cabinet can be operated at maximum efficiency.

BASIC OPERATION

Air is withdrawn from chamber thru blower intake opening at top of inner chamber. It is then propelled downward thru false back wall plenum chamber where cooling coils are located. Air is chilled to desired dew point temperature at this stage. Air then passes over water reservoir at bottom of unit and changing to near saturation. Forced up thru a perforated plate, over dry bulb heaters, it is re-heated to its original temperature. From here air convected thru secondary perforated plate to diffuse evenly and vertically throughout entire bottom cross sectional area.

The phenomena of air to hold greater amounts of water vapor at higher temperatures than at lower temperatures is utilized to obtain any desired relative humidity at any temperature within the range of the cabinet. The principle may best be illustrated by imagining an elastic container which expands rapidly with temperature rise. Assume its volume at 50° F., is one cubic ft. and at 80° F. its volume expands to 2 cu. ft. If container is full of water at 50°F., it is considered to be 100% full. If heated to 80° F., the same amount of water is present but container is now only 50% full because of increased capacity.

Conversely if tank is 100% full at 80° F. and is cooled to 50° F., excess water will be "squeezed" out as tank contracts. The same is true of hot saturated air. Excess moisture will condense out as cooled.

Dry Bulb Control and Dry Bulb Heaters control the temperature. Wet Bulb Control, Wet Bulb Heaters and the Cooling Coil control the humidity level. The wet bulb control senses the changes, and, either removes moisture by energizing cooling coil solenoid or adds moisture by energizing wet bulb heaters.

VER TEMPERATURE PROTECTION FEATURE.

This unit is equipped with a packaged over temperature protection unit located at rear wall inside of control compartment. It consists of a seperate control, power relay and reset switch. When properly set, it will provide fool proof protection of cabinet and work load in event that the primary control circuit loses control of cabinet. To illustrate need of the device, the micro-switch on the super-sensitive wet bulb control may operate 2,400,000 times in a 30 day period. Low voltage (24V) control system minimizes danger of contacts sticking. Safety device prevents damage if contacts should fail.

1) Turn control knob all the way clockwise (Maximum). Press reset switch to start unit.
2) Proceed with operating instructions listed below.

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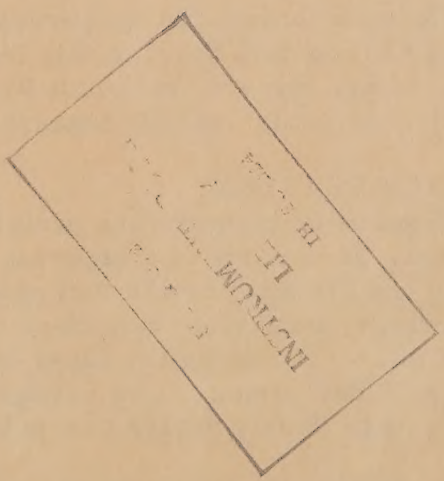


3) After cabinet has stabilized at desired conditions, very slowly rotate knob counterclockwise until the control point is reached and safety relay disconnects cabinet. Now, rotate knob clockwise, approximately 1 1/2 divisions of dial reference marks. Press reset switch to re-start unit. Safety control is now set a few degrees above dry bulb temperature. Any undesired temperature rise will trip circuit and shut cabinet down completely. It is not necessary to repeat above procedure once safety control is set as safety relay locks in permanently, independently of main switch. It must be repeated if it trips or a power failure occurs.

4) Check proper operation periodically, particularly before starting a critical test. Deliberately turn wet bulb or dry bulb thermostat to a higher setting and observe whether or not cabinet shuts off within the limit it is set for.

ERATING INSTRUCTIONS:

Be sure that installation instructions have been completed. Valve should be set and water level established in cabinet.

Turn main switch "on". Main pilot light will indicate unti is energized.

Turn Blower switch "on".

Set Power Selector switch at either "low" or "high" settings. DO NOT use medium setting as this results in unbalanced heat distribution of dry bulb heaters. "Low" setting maintains most conditions and provides closest temperature control. "High" setting used only for rapid runup or maintaining low humidity at high temperature.

Set dry bulb control as desired. Control is calibrated in degrees and calibration is reasonably accurate. However, all settings must be verified with dry bulb thermometer and adjustments made accordingly. After unit has stabilized, set control so that the temperature shown on thermometer coincides with temperature indicated by control knob by means of the "fine adjust" knob. Turning knob in (clockwise) raises cabinet temperature. Backing knob out (counterclockwise) lowers cabinet temperature.

Set Wet Bulb Control at desired wet bulb temperature. (Consult enclosed psychometric chart for correct wet and dry bulb settings for any given condition). Wet bulb control also calibrated in degrees but cannot be accurately calibrated. It's calibrations read wet bulb temperatures while in reality it is actually controlling dew point temperature. By controlling chilled temperature of air, finer control of the humidity is obtained while also eliminateing necessity of a wet bulb wick. NO WICKS ARE NEEDED OR SUPPLIED. Unit will stabilize at approximately the setting on Wet Bulb Control. Raise or lower setting as indicated on wet bulb thermometer. Control may be calibrated precisely for any one temperature by following the procedure described in calibration of Dry Bulb Control.

Turn wet bulb heater switch "on". Wet bulb heaters are not required and need not be energized when cabinet is being used at low humidity range.

Adjust Cooling Coil Valve for minimum water flow to maintain desired wet bulb temperature. Opening valve excessively causes an excessive drop in wet bulb temperature which will result each time solenoid opens. Allow minimum water flow to produce a slight drop in wet bulb temperature and allow control to actuate. The wet bulb temperature will be controlled within very fine tolerances when valve is properly adjusted. When operating at lower humidities, valve must be opened further to allow more cooling water to flow. When operating at low dry bulb temperature where the cooling effect of water is less effective, more water must be allowed to flow.

Air Flow Control. Located at top of work chamber, adjacent to blower intake opening, are a set of adjustable slides. Leave full open for most conditions to provide best temperature uniformity. However, to obtain extremely high humidities at low dry bulb temperatures, or to produce condensation on test specimens, air flow must be sharply reduced. Adjust slides accordingly to reduce area of blower intake opening.

(Continued)

MAINTENANCE & SERVICE INSTRUCTIONS:

If unit fails to operate properly after long period of service, check following:

a) Chcek power source and fuses.

b) Inspect wiring carefully for broken or loose connections. Tighten or repair.

c) Test controls by observing operation for a few minutes. If hygrometer indicates condition is changing and control does not actuate, it may be assumed control is defective.

d) BACK FLUSH WATER STRAINER PERIODICALLY. Connect rubber hose to small drain vlave cock mounted on "Y" strainer. Open valve for 15 minutes allowing water to flow reversely through strainer into a drain or container. Reverse water flow through strainer screen dislodges foreign particles screened out during usage.

e) At lease once a year, bottom perforated diffuser plate and dry bulb element must be removed and bottom of cabinet (water reservoir) completely scoured and cleaned. With hot water constantly being evaporated stainless steel becomes covered with calcium deposits and will eventually show signs of deterioration. Consult enclosed technical bulletin #104 for details on "Corrosion of Stainless Steel".

f) Most difficulties encountered result from adverse water conditions. Water conditions vary in different sections fo the country. If you previously experienced problems with other types of equipment using water, very likely these same problems will be encountered with this cabinet. Solenoid valve, strainer, and one (1) manual main valve are the only functional devices in direct contact with water.
If water conditions in your area are considered poor, these parts will require periodic inspection and cleaning; especially solenoid valve.
Consult enclosed instructions for details of solenoid.

BACK FLUSH STRAINER FREQUENTLY

TROUBLE SHOOTING:

Listed below are various symptons of malfunctions, probable cause and correction of same:

A) condition: Controls seem to function properly but R.H. cannot be raised above approximately 85%, regardless of dry bulb setting:
cause: Wet bulb heater is burned out; or, is otherwise not energized.
remedy: a) Check wet bulb heater for continuity. If open circuit exists, replace.
b) If heater registers continuity, check all connections in wet bulb heater circuit.
c) If all connections are made, check normally open contacts of small wet bulb relay. Clean with fine sand paper and retest.

B) condition: Wet or dry bulb temperature "runs away" uncontrolled or temperature will not rise at all. Turning control knob will not produce control action as evidenced by pilot lights. Pilot lights stay "ON" and relays do not actuate:
cause: Control is defective. Above condition indicates micro-switch only is defective.
remedy: Order and replace micro-switch in defective control. Entire control need not be replaced.

C) condition: Same as above except turning control manually does produce control action but when control is set in the "ON" position cabinet temperature rises and control will not shut off. Conversely, when manually turned to the "OFF" position, it never turns on.
cause: Control is defective. Above condition indicates that thermal bellows assembly has lost charge.
remedy: Return for repair and/or replace entire control.

(Continued)

D) condition: Controls and relays appear to be functioning properly but cannot raise wet bulb temperature. Cabinet operates at extremely low humidities regardless of wet bulb control setting. Wet bulb pilot light indicates "heat on".

cause: Cooling water flowing continuously even though control and pilot light indicates "OFF".

remedy: a) Check wet bulb relay. Be sure that coil connections are properly made and relay actuates in response to wet bulb control movement. Failure of relay to respond means wet bulb relay must be replaced.

b) If relay is actuating properly, then solenoid valve is "open" constantly. Dismantle and clean. Replace if necessary.

E) condition: Controls and Relays appear to work properly but humidity approaches near saturation with no control of wet bulb temperature whatever:

cause: NO cooling water flowing thru cooling coil, regardless of control action.

remedy: a) Check wet bulb relay as mentioned in condition (D) above.

b) If relay is okay, strainer may be completely clogged, preventing full water flow. Flush for 15 or 20 minutes.

c) If strainer is okay, solenoid is "closed" constantly for one of the following reasons:

1) Solenoid coil is burned out. Check continuity. Replace if open circuit exists. Usually an audible click is heard as solenoid coil is energized or de-energized.

2) If coil is no defective solenoid is clogged or corroded in the "closed" position. Dismantle, clean and/or replace.

NOTE: The plunger can be heard clicking on and off even though solenoid valve section is closed. DO NOT ASSUME that water flow is being controlled properly just because solenoid "sounds" like it is working.

F) condition: All controls appear to be functioning and cycling properly. However, dry bulb temperature is erratic and varies excessively and wet bulb varies to a lesser degree. Air flow is sharply reduced. Water droplets are blown into working area.

cause: Cabinet is "flooded". Water level has increased to dry bulb heaters. No clearance space exists between water surface and dry bulb heaters for proper air flow. A restriction exists in outside drain and back pressure is preventing proper gravity drain from overflow tube.

remedy: 1) Use larger diameter pipe to drain.

2) Move cabinet closer to floor drain.

The above "TROUBLE SHOOTING" information will assist and guide maintenance departments in locating sources of trouble. All eventualities cannot be foreseen. Quite possibly a condition may occur not covered above. However, please remember, 90% of all difficulties are dur to the following:

1. CORROSIVE WATER SUPPLY

2. LOOSE OR BROKEN ELECTRICAL CONNECTIONS

3. LACK OF PERIODIC PREVENTIVE MAINTENANCE OF ITEMS 1 & 2 ABOVE.

(Continued)

Consult drawing and wiring diagram for references made in this text.

For any further information contact Factory.

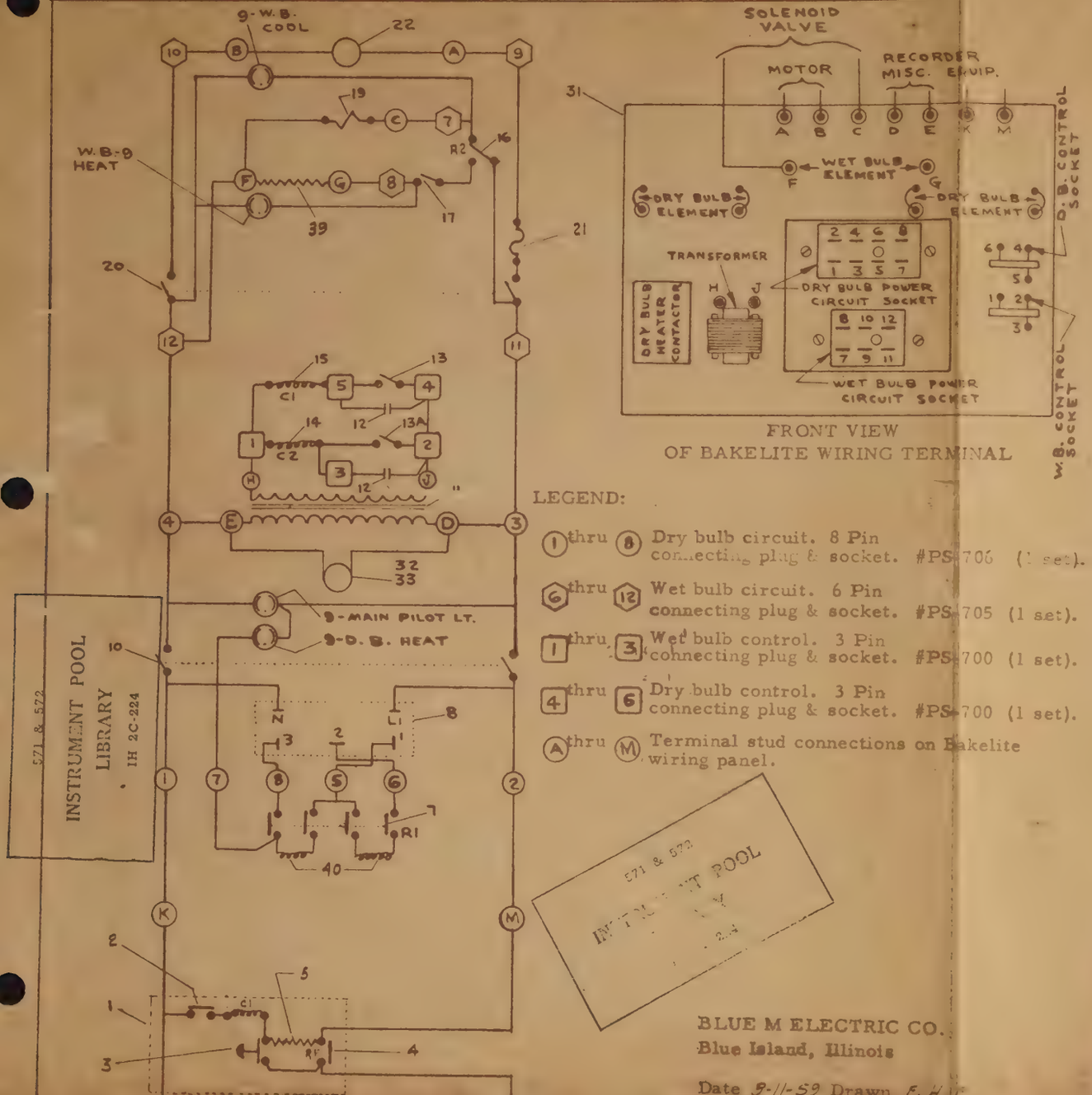
BLUE M ELECTRIC COMPANY
138TH & CHATHAM STREET
BLUE ISLAND, ILLINOIS U.S.A.
Telephone: FUlton - 5 - 9000

ELECTRICAL WIRING DIAGRAM AND PARTS LIST FOR
BLUE M COUNTER-FLOW RELATIVE HUMIDITY CABINET

WD-640-1B

Bench Model CF-740H
Inside Dimensions 14W x 13D x 14H

Temperature Range Room to 85°C.
Total Wattage 1,400
Voltage 115V/1ph/60c. A.C.



FRONT VIEW
OF BAKELITE WIRING TERMINAL

LEGEND:

(1) thru (8) Dry bulb circuit. 8 Pin connecting plug & socket. #PS-706 (1 set).

(6) thru (12) Wet bulb circuit. 6 Pin connecting plug & socket. #PS-705 (1 set).

(1) thru (3) Wet bulb control. 3 Pin connecting plug & socket. #PS-700 (1 set).

(4) thru (6) Dry bulb control. 3 Pin connecting plug & socket. #PS-700 (1 set).

(A) thru (M) Terminal stud connections on Bakelite wiring panel.

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BLUE M ELECTRIC CO.
Blue Island, Illinois

Date 9-11-59 Drawn E.H.C.
Chk'd. L.H. Approved

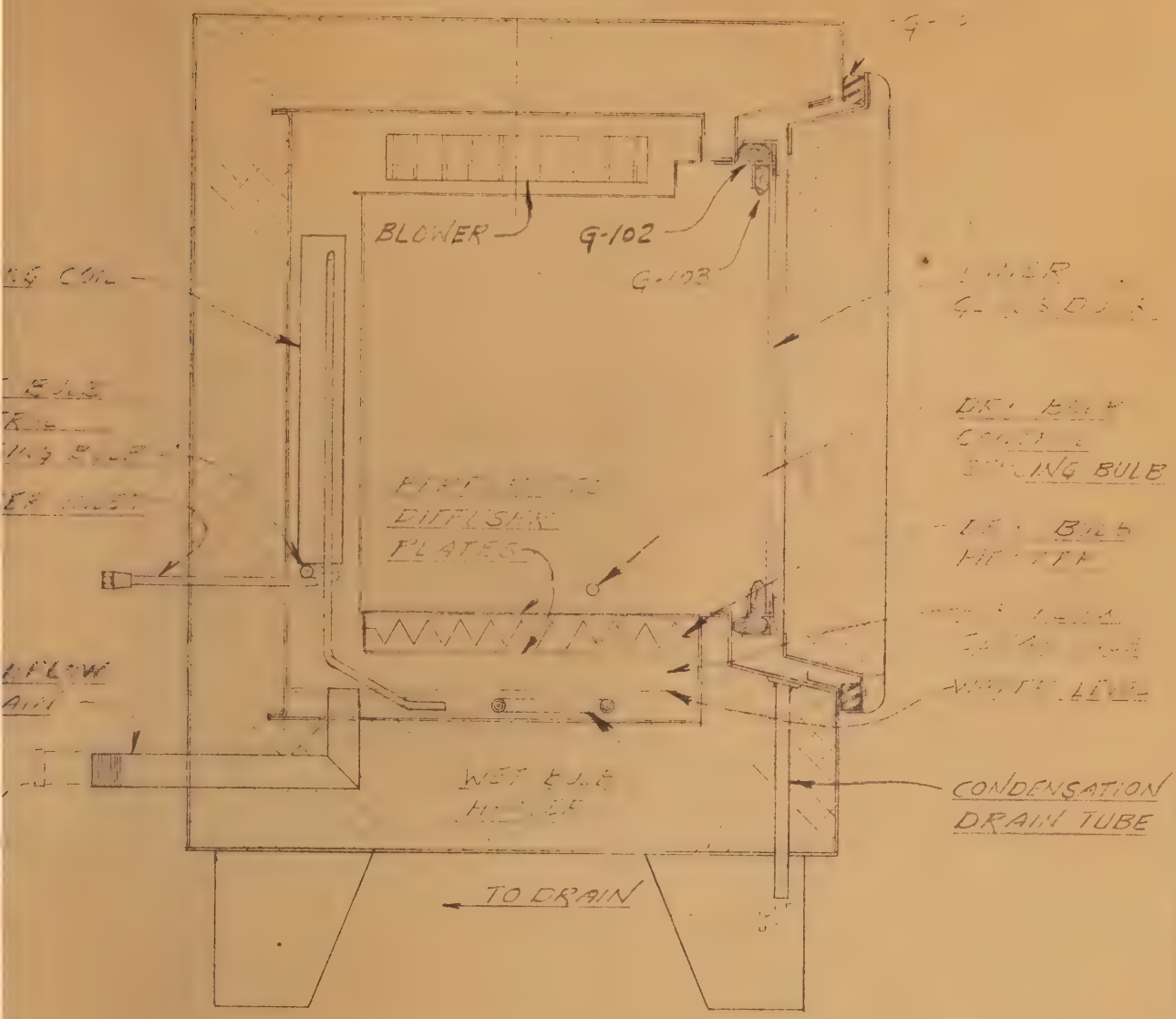
REPLACEMENT PARTS LIST

Item No.	Description	Part Number	No. Req'd.	Price Each
1	Over Temperature Protection Unit	OTP-100	1	$ 55.00
2	Safety control	C-1002	1	20.75
3	Reset switch	S-3096	1	
4	Safety relay	R-2000	1	
5	Resistor	R10-100	1	8.50
6				
7	Dry bulb control contactor	R3-2014	1	34.00
8	Power selector switch - D.B.	S-3013	1	5.75
9	Neon indicating lamp	P1-4017	4	1.00
* 9A	Pilot light assembly	P3-4016	4	2.25
10	Main switch	S-3016	1	4.00
11	Control transformer 24V.	T-8015	1	9.50
12	Arc supressing condenser	MF60-.25	2	2.00
13	Dry bulb control	CA-1082	1	20.75
13A	Wet bulb control	CA-1082	1	20.75
* 13B	Replacement control Micro switches	S-3101	2	3.50
14	Wet bulb relay coil only - 24V.	R-2039C	1	4.25
15	Dry bulb contactor coil only - 24V.	R3-2014C	1	7.50
16	Wet bulb relay	R-2039	1	8.50
17	Wet bulb heater switch	S1-3016	1	4.50
18				
19	Solenoid valve	V-9011	1	27.50
20	Motor starter	S-3026	1	8.75
21	Motor overload heaters	HP-26	1	2.00
22	Blower motor	M-5031	1	32.50
* 23	Blower wheel	BW-117	1	11.00
* 24	Blower shaft	BS-110	1	12.50
* 25	Clipper seal	CS-100	1	3.00
* 26	Cooling coil	CC-607	1	18.00
* 27	Water strainer	ST-800	1	14
* 28	Manual water valve	V-9007	1	4
* 29	Hygrometer	T-509X	1	42.00
* 30	Shelves - Expanded S/S	SH-1041	2	12.00
* 31	Bakelite wiring panel complete ass'y.	BP-103	1	As Quoted
** 32	Recorder - 24 Hr. (W & D Bulb)	T-522A	1	295.00
** 33	Recorder - 7 Day (W & D Bulb)	T-522B	1	295.00
* 34	Inner glass door (Complete)	GD-107	1	47.50
* 35	Inner glass door seal only (Large)	G-117	1	4.50
* 36	Outer door seal	G-101-1	1	4.00
* 37	Glass panel seal only (Small)	G-121	1	3.00
* 38	Inner door catch	L-106	3	4.00
39	Wet bulb element (Frame & Coil)	A-121-278	1	74.00
39A	Wet bulb element - coils only	A-121-278C	1	16.00
40	Dry bulb element (Frame & Coil)	A-121-279	1	132.00
40A	Dry bulb element - coils only	A-121-279C	1	32.00
* 41	Hygrometer W.B. Wicking (36"Lg.)	WK-101	1	3.00
** 42	Recorder Charts - 24 Hr. (per 100)	RC-100	1	4.85
** 43	Recorder Charts - 7 Day (per 100)	RC-101	1	4.85
** 44	Wet bulb water box	WB-705	1	9.50
** 45	Recorder Wicks (per dox.)	WK-100	1	9.00

* PARTS NOT SHOWN
** OPTIONAL ACCESSORIES

Prices subject to change without notice. Parts shipped F.O.B. Blue Island, Ill.
When ordering parts, give MODEL NO., SERIAL NO., VOLTAGE & ...

DESCRIPTIVE DRAWING OF BLUE-M- JUNIOR - FLOW CONTROLLED REFLUXING HUMIDITY CHAMBER



GRAVITY DRAIN SYSTEM MUST NOT BE CONNECTED WHERE HIGH BACK PRESSURE IS CREATED. LONG PIPE RUNS SHOULD BE AVOIDED.

			PART NAME DESCRIPTIVE DRAWING		BLUE M ELECTRIC CO. BLUE ISLAND, ILLINOIS	
			USED ON CF-740H, CF2-840 & CPR-855 SERIES			
WAS	BY	DATE	MAT'L	NO. SHEETS	NO. REQ.	DRAWING NO.
REVISIONS						
CHECKED JAL	SCALE	DATE 5-7-57	FINISH	SHEET NO.	SHEET SIZE A	A-1259Q

INSTRUCTION #I-176
DATE 2/25/59
COMPILED BY J.L.

SUPPLEMENTARY INSTRUCTIONS FOR BLUE M ELECTRIC CO. WATER COOLED HUMIDITY CHAMBERS

When operating at or near room temperature, any tendency of wet bulb and dry bulb temperatures to drift erratically can be traced to fluctuating tap water temperatures. Varying water temperature does not affect cabinet condition appreciably above 110°F.

Water outlets closest to the water main coming into building are the coldest and most stable. Outlets fed by buried water pipes provide more stability than overhead piping that is affected by room heat.

Water outlets in lines that are heavily used are colder and more stable than outlets in lines that are used intermittenly. If water is flowing continuously to other equipment, the water in that line will be colder and remain stable.

If convenient, connect this unit to a water source that is maintained at a constant temperature if possible.

Where it is impossible to provide a constant temperature water source to the cabinet, operate with wet bulb heater switch "Off" when controlling at or near room temperature.

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